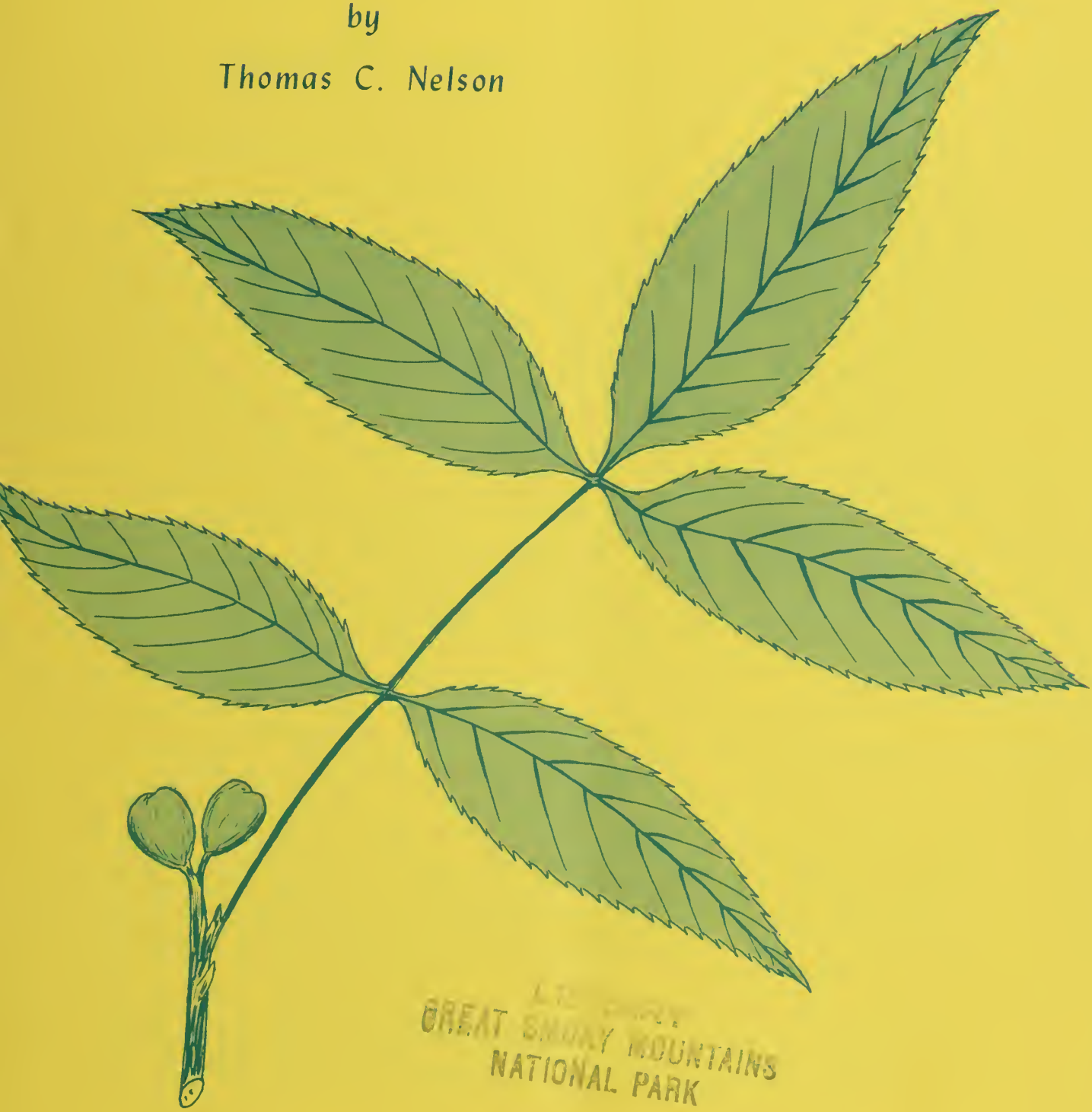
Carya glabra - 44

Silvical Characteristics of Pignut Hickory

by

Thomas C. Nelson



GREAT SMOKY MOUNTAINS
NATIONAL PARK

Station Paper No. 137

November 1961

U.S. Department of Agriculture
Forest Service
Southeastern Forest Experiment Station
Asheville, North Carolina

Silvical Characteristics of Pignut Hickory

(Carya glabra (Mill.) Sweet)

by

Thomas C. Nelson

"Pignut hickory," in common usage, is an ambiguous term. No less than five of the presently recognized species of hickory are called "pignut hickory" in various sections of the country. The taxonomy of the species and its varieties is still in a state of flux (10). The most widely recognized pignut hickory is Carya glabra (Mill.) Sweet and this discussion, except where specifically stated, refers to the typical variety (Carya glabra var. glabra). The binomial, Carya ovalis (Wangenh.) Sarg., was reduced to synonymy in the 1953 Check List (10), and is now included under Carya glabra var. glabra. Other common names for this variety include oval pignut hickory, red hickory, redheart hickory, small-fruited hickory, and sweet pignut. Pignut, as is true with most hickory species, loses its identity in the lumber market and is sold as "hickory" (10).

Pignut hickory is distributed from southern Maine to southern Ontario and southern Michigan south to the Atlantic and Gulf Coastal Plains (fig. 1), and reaches its largest size in the basin of the lower Ohio River (13). It is the hickory most commonly found in the Appalachian forest (12) and grows at higher elevations in the Southern Appalachians than the other hickories (13). Pignut probably furnishes most of the hickory cut in the Cumberland Mountains of Tennessee, Kentucky, and West Virginia, and in the hill country of the Ohio Valley.

HABITAT CONDITIONS

CLIMATIC

Pignut hickory grows in a humid climate and the super-humid climate (17) of western North Carolina is particularly suited for its growth and development. Average annual rainfall in its range varies from 30 inches to approximately 80 inches, 20 to 40 inches falling during the growing season. Average snowfall varies from 1 inch per year in the south to 80 inches in the north (9).

Average annual temperatures range from 45° to 65° F.; average July temperatures from 70° to 80°; and average January temperatures from 20° to 50°. Extremes of 115° and -30° have been recorded within its range. The average growing season varies by latitude from 140 to 240 days (9).

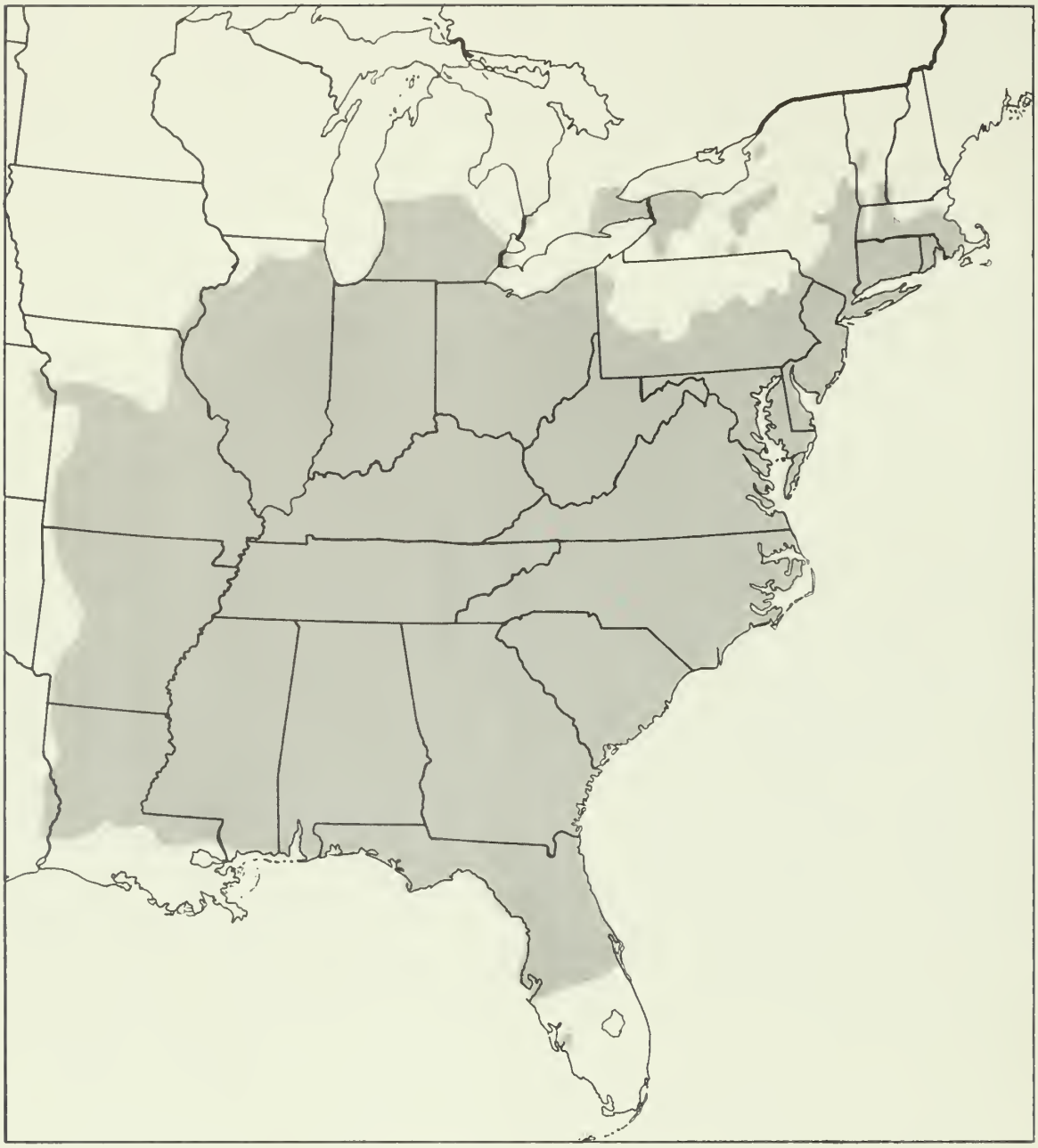


Figure 1.--Botanical range of pignut hickory.

EDAPHIC AND PHYSIOGRAPHIC

Pignut hickory, in general, inhabits dry ridges and hillsides (13) (fig. 2). According to Boisen and Newlin (5), however, it responds readily to increases in soil fertility, and Westveld (22) states that it is also common on moist sites in the Southern Appalachian region. Mitchell and Chandler (11) class pignut as intermediate in terms of tolerance or growth on nitrogen-deficient soils.

BIOTIC

Pignut hickory is usually a minor species in the types in which it is found. It is listed as a component of only two forest cover types, the post oak-black oak type and the white oak-red oak-hickory type (14). In the post oak-black oak type, it is associated with southern red oak (Quercus falcata), white oak (Quercus alba), scarlet oak (Quercus coccinea), shingle oak (Quercus imbricaria), live oak (Quercus virginiana), shortleaf pine (Pinus echinata), Virginia pine (Pinus virginiana), blackgum (Nyssa sylvatica), mockernut hickory (Carya tomentosa), sourwood (Oxydendrum arboreum), red maple (Acer rubrum), post oak (Quercus stellata), black oak (Quercus velutina), blackjack oak (Quercus marilandica) and other less important species. In the white oak-red oak-hickory type, it occurs with a number of combinations of oaks and hickories.

Braun (5), in describing the forest of the Piedmont upland, places pignut in association with loblolly pine (Pinus taeda), longleaf pine (Pinus palustris), shortleaf pine, southern red oak, post oak, black oak, blackjack oak, mockernut hickory, and flowering dogwood (Cornus florida).

LIFE HISTORY

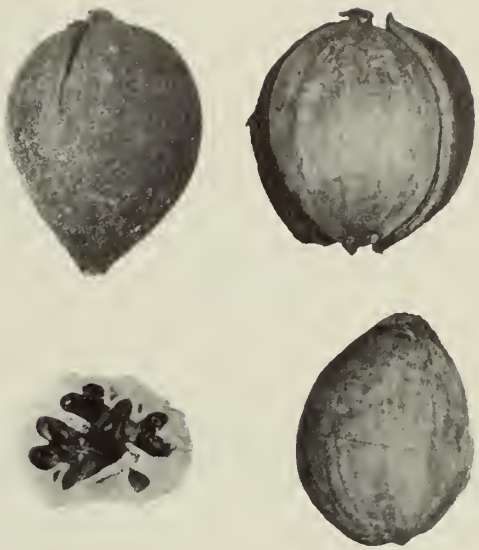
SEEDING HABITS

Flowering and fruiting.--The flowers of pignut hickory are monoecious. The male flowers are borne in catkins from 3 to 7 inches long and are covered with a soft, scurfy pubescence. The female flowers are produced in 2 to 5 flowered spikes, about $\frac{1}{4}$-inch in length. Flowers open from the middle of March near the southwest extreme of its range to the beginning of June in New England (13).

The fruit ripens in September and October, and seeds are dispersed from September through December (20) (fig. 3).

Seed production.--Pignut hickory reaches commercial seed bearing age at 30 years, and optimum seed production occurs at ages of 75 to 200 years. The maximum age for commercial seed production is 300 years. Good seed crops occur every year or two, with small seed crops in the other years (18), and Sudworth (16) estimates that 50 to 75 percent of the fresh seed will germinate. Pignut is one of the lighter-seeded hickories, averaging 200 seed per pound (20).

Figure 2.--An open-grown pignut hickory, located in Greene County, Georgia. The tree is about 109 feet tall and 36 inches d.b.h.



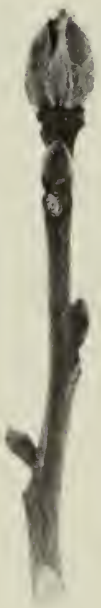


Figure 3.--Typical bark, fruit, twig and bud, and leaves of pignut hickory.

The hickory shuckworm (Laspeyresia caryana) is probably a major factor in reducing germination (2).

The fruit is too small to warrant collecting for human consumption, although the kernels are usually sweet.

Seed dissemination. --The fruit of pignut is disseminated principally by gravity, but because it is attractive to animals, they are also probably important in dissemination of the seed. Some of the more important animals are red squirrel (Sciurus hudsonicus), eastern grey squirrel (Sciurus carolinensis), eastern fox squirrel (Sciurus niger), chipmunk (Tamias striatus), and raccoon (Procyon lotor).

VEGETATIVE REPRODUCTION

Although pignut hickory sprouts prolifically from the stump (4), it is generally conceded to be difficult to reproduce from cuttings.

SEEDLING DEVELOPMENT

Establishment. --Hickories, in general, require a moderately moist seedbed for seed germination (22). Pignut seems to establish itself best in a microclimate created by hardwood duff and litter.

Early growth. --Seedling growth of pignut hickory is very slow. Boisen and Newlin (4) report the following height growth of seedlings in the Ohio Valley in the open or under light shade, on red clay soil:

Age (Years)	Height (Inches)
1	3.0
2	5.8
3	8.0
4	12.0
5	17.0

Pignut is considered by Toumey to have a very inflexible rooting habit (18). The species tends to develop a pronounced taproot with few lateral roots; this is especially true of young seedlings, but it is also a strong habit in older trees--even where soil conditions are not conducive to taproot development.

SAPLING STAGE TO MATURITY

Growth and yield. --Pignut hickory often reaches 80 or 90 feet in height, and occasionally 120 feet. The trunk is frequently forked, and maximum d. b. h. is 3 to 4 feet (13). Height and diameter in relation to age for selected locations are shown in table 1.

Table 1.--Height and diameter growth of pignut hickory in selected portions of its range (4)

Age (years)	D. b. h.	Height			
	Southern Indiana, northern Kentucky 1/	Ohio Valley 1/	Northern Ohio 1/	Cumberland Mountains 2/	Mississippi Valley 2/
	Inches	Feet			
10	1.0	9	7	6	6
20	2.0	19	20	14	19
30	3.2	32	35	24	27
40	4.4	42	48	32	34
50	5.5	51	61	40	40
60	6.8	58	69	48	46
70	8.4	64	74	55	52
80	10.0	69	--	62	58
90	11.4	--	--	69	64
100	--	--	--	75	69
120	--	--	--	85	79
140	--	--	--	93	88
160	--	--	--	99	96
180	--	--	--	104	101
200	--	--	--	108	105

1/ Second growth.
2/ Virgin forest.

On both dry and moist sites of the Southern Appalachian region, pignut hickory will produce sawtimber, but in the longleaf pine-turkey oak type of the southern pine region it never reaches saw-log size (22).

Reaction to competition.--The species is classified as intolerant in the northeast and tolerant in the southeast (15). Baker (1) classifies hickories about equally as intermediate or intolerant. Pignut hickory is a climax species in the oak-hickory type throughout most of its range.

Principal enemies.--Pignut hickory is easily damaged by both frost and fire (21), which results either in degrade of the tree, loss of sound volume or both. Much degrade in Appalachian hickory is also caused by sapsucker (Sphyrapicus varius) injury (12).

Pignut is attacked by anthracnose (Gnomonia caryae) and witches' broom (Microstroma juglandis). A bark canker caused by Nectria galligena is also reported (19). Phomopsis tumor is widespread on hickories and probably occurs on pignut (6).

The most common disease of the species from Pennsylvania southward is a trunk rot caused by Poria spiculosa. A single trunk canker near the base is a sign that the butt log is badly affected, and multiple cankers are evidence that the entire trunk has an extensive rot cylinder (7).

An important insect enemy is the hickory bark beetle (Scolytus quadrispinosus); logs and dying trees are attacked by Ambrosia beetles (Platypus compositus) and powder-post beetles (Xylobiops basilaris) (2). Pignut is probably one of the preferred foods of the hickory twig girdler (Oncideres cingulatus), and it is attacked by several species of gall insects.

RACES AND HYBRIDS

There are undoubtedly races of pignut hickory, but its taxonomy has been subject to so many changes that differentiation of varieties, races, and separate species is confusing.

Boisen and Newlin (4) list four variants of the typical pignut; var. microcarpa, var. odorata, Hicoria villosa, and Hicoria pallida. The last two have been renamed Carya texana and Carya pallida (10).

Red or false pignut hickory was recognized until 1953 as a separate species. It is similar in its silvical habits to pignut hickory (8) and, in general, statements made for pignut hickory will be true for the red hickory variant.

Coast pignut hickory (Carya glabra var. megacarpa) is still recognized as a variety (10). It is also called Ashes hickory, hammock hickory, and southern pignut hickory. Its range extends from western New York to southern Ohio and southern Illinois, south to Louisiana and central Florida (10). In the southern portion of its range, coast pignut is limited to upland sites of the coastal plain (3).

Three distinct species in Florida have been proposed as variations of coast pignut hickory pending further field studies: Carya ashei, Carya austrina, and Carya magnifloridana (10).

One hybrid, Carya X demareei Palmer (Carya cordiformis x glabra), has been recorded (10).

LITERATURE CITED

(1) Baker, F. S.
1949. A REVISED TOLERANCE TABLE. Jour. Forestry 47:179-181.

(2) Beal, James A.
1952. FOREST INSECTS OF THE SOUTHEAST: WITH SPECIAL REFERENCE TO SPECIES OCCURRING IN THE PIEDMONT PLATEAU OF NORTH CAROLINA. Duke Univ. School Forestry Bul. 14, 168 pp., illus.

(3) Bishop, G. Norman, and Nelson, Thomas C.
1955. A WINTER KEY TO THE HICKORIES OF GEORGIA. U. S. Forest Serv. Southeast. Forest Expt. Sta. Res. Notes 89.

(4) Boisen, Anton T., and Newlin, J. A.
1910. THE COMMERCIAL HICKORIES. U. S. Dept. Agr. Forest Serv. Bul. 80, 64 pp., illus.

(5) Braun, E. Lucy
1950. DECIDUOUS FORESTS OF EASTERN NORTH AMERICA. 596 pp., illus. Philadelphia and Toronto.

(6) Brown, N. A.
1938. THE TUMOR DISEASE OF OAK AND HICKORY TREES. Phytopathology 28: 401-411, illus.

(7) Campbell, W. A., and Verrall, A. F.
1956. FUNGUS ENEMIES OF HICKORY. U. S. Forest Serv. Southeast. Forest Expt. Sta. Hickory Task Force Rpt. 3, 8 pp., illus.

(8) Harlow, William M., and Harrar, Ellwood S.
1941. TEXTBOOK OF DENDROLOGY. Ed. 2, 542 pp., illus. New York and London.

(9) Kincer, J. B.
1941. CLIMATE AND WEATHER DATA FOR THE UNITED STATES. U. S. Dept. Agr. Yearbook 1941, pp. 685-747, illus.

(10) Little, Elbert L., Jr.
1953. CHECK LIST OF NATIVE AND NATURALIZED TREES OF THE UNITED STATES (INCLUDING ALASKA). U. S. Dept. Agr. Handb. 41, 472 pp.

(11) Mitchell, Harold L., and Chandler, Robert F., Jr.
1939. THE NITROGEN NUTRITION AND GROWTH OF CERTAIN DECIDUOUS TREES OF NORTHEASTERN UNITED STATES. Black Rock Forest Bul. 11, 94 pp., illus.

(12) Paul, Benson H.
1929. THE QUALITY OF APPALACHIAN HICKORY. FOREST PRODUCTS LABORATORY SHOWS THAT APPALACHIAN HICKORY COMPARES FAVORABLY WITH OTHER HICKORIES. South. Lumberman 135(1749): 29-32.

(13) Sargent, Charles S.
1890. THE SILVA OF NORTH AMERICA. Vol. VII, 173 pp., illus. Boston and New York.

(14) Society of American Foresters
1954. FOREST COVER TYPES OF NORTH AMERICA. Soc. Amer. Foresters, 67 pp., illus. Washington, D. C.

(15) Society of American Foresters
1955. FORESTRY HANDBOOK. Iv. (various pagings), illus. New York

(16) Sudworth, Geo. B.
1900. THE FOREST NURSERY: COLLECTIO . OF TREE SEEDS AND PROPAGATION OF SEEDLINGS. U. S. Dept. Agr. Di . Forestry Bul. 29, 63 pp., illus.

(17) Thornthwaite, C. W.
1941. ATLAS OF CLIMATIC TYPES IN THE UNITED STATES, 1900-1939. U. S. Dept. Agr. Misc. Pub. 421, 95 pp., illus.

(18) Toumey, J. W.
1929. INITIAL ROOT HABITS IN AMERICAN TREES AND ITS BEARING ON REGENERATION. Internatl. Plant Sci. Cong. Proc. 1926:713-728.

(19) U. S. Department of Agriculture
1952. INDEX OF PLANT DISEASES IN THE UNITED STATES, PART IV. Spec. Pub. 1, Plant Disease Survey, Agr. Res. Admin., pp. 531-806.

(20) U. S. Forest Service
1948. WOODY-PLANT SEED MANUAL. U. S. Dept. Agr. Misc. Pub. 654, 416 pp., illus.

(21) Van Dersal, William R.
1938. NATIVE WOODY PLANTS OF THE UNITED STATES, THEIR EROSION-CONTROL AND WILDLIFE VALUES. U. S. Dept. Agr. Misc. Pub. 303, 362 pp., illus.

(22) Westveld, R. H.
1949. APPLIED SILVICULTURE IN THE UNITED STATES. Ed. 2, 590 pp., illus. New York and London.

Agriculture - Asheville